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THE TREATMENT OF EPILEPSY

With special reference to Epilepsy of a  
toxaemic character.

Being a Thesis for the Degree of M.D.  
University of Edinburgh.

by

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toxaemic character.

There are few diseases, with the exception of those for which nothing can be done, which present so many difficulties in treatment or produce so much despair to the physician as epilepsy. In any disease where the pathology, and etiology remain as obscure as in this, the treatment must be, to a large extent, empirical. In spite of the vast amount of pathological research which has been done in recent years, the most that can be determined is that previous pathologists have been mistaken, or that their deductions have been faulty, while the real cause of epilepsy remains a will-of-the-wisp.

Perhaps one of the main reasons for this is that this disease, manifesting itself as it does by symptoms mainly referable to the cerebral cortex, has been held to have its primal inception in that region, to the neglect of a body tissue which above all others can modify any function of the cerebrum - the blood. The fits or convulsions which are the typical symptoms of this disease can be simulated by the effects produced on the brain cortex by

various drugs or poisons circulating in the blood stream, and it is here in all likelihood that the future pathology of epilepsy will find its path most productive, especially in that form of epilepsy hereto known as idiopathic. The psychic symptoms associated with the convulsion present so many similarities to those more or less believed to be due to the condition of the cerebral circulation, and controllable by drugs modifying that circulation, as almost to offer a complete parallel and Turner<sup>(1)</sup> has recently shown the close relation between convulsions and increased tendency of the blood to coagulate, and previous writers, Kussmaul<sup>(2)</sup> Hill<sup>(3)</sup>, Pierce Clark<sup>(4)</sup> etc. have demonstrated how dependent epileptic seizures might be on cerebral anaemia or stasis. One need not refer to the convulsions that frequently occur shortly before death in cases of severe loss of blood. With no intention to enter farther into the pathology of this disease, one can but point out that where the seat of disease is the cortex, little modification can be expected by means of remedial agents given internally, whereas by conceding to the blood stream a

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1. Journal of Mental Science, January 1907.
  2. New Sydenham Society, London 1859.
  3. The Cerebral Circulation, London 1896.
  4. Amer. Journal of Insanity, April 1900.

share in the causation, one can the more hopefully proceed to the treatment, in the expectation that where therapeutics has proved valuable, the remedies long hailed as empirical may receive a designation less savouring of stigma.

The direct treatment of all diseases is subordinate to that which can be achieved by removal of the cause, and unfortunately the search for this so often proves unsuccessful in epilepsy, that a small class of cases, forming "Reflex Epilepsy" includes nearly every instance. It is convenient, therefore, to consider this class of case first, as usually the results of treatment are definite and by some observers it is not included as true epilepsy. However, whether it be a class by itself in nomenclature or not, it is in treatment, and this includes both medical and surgical. Having found a reflex cause, one proceeds to its removal. Intestinal worms are very common agents, the most usual being the round and tape worms. In these cases recourse to a vermifuge will effect their removal and lead to cessation of the fits.

Indigestion, again, plays a large part as a reflex causal agent. Here a careful attention to diet will prove most useful while the most useful drug to employ is nux vomica in combination with bitters.



This drug has gained some reputation in the hands of homoeopaths in the treatment of epilepsy, and it certainly is beneficial in many cases, apart from reflex. In one case in the writer's experience when prescribed in  $\eta$  V doses with infusion of Gentian it produced a cessation of fits for at least three months, until the case was lost sight of.

A common reflex cause of epilepsy is believed by many to be errors of refraction. A systematic examination of patients would prevent this being overlooked and suitable means adopted.

Cicatrices are often given as the points of development of the aura. These should be removed, if the physician is convinced that they are the probable excitants. In some recorded cases, pressure on such an area has been found to provoke a typical seizure<sup>(1)</sup>.

A case is on record<sup>(2)</sup> where after bromide treatment had proved useless a patient who suffered from epileptic seizures at the menstrual periods only, was cured by scarification and removal of half-an-ounce of blood from the cervix for a day or two before the commencement of the flow. On this being omitted the fits recurred, but finally ceased under hot applications to the abdomen which the patient repeated each month with complete success.

1. Nothnagel. Sprathing Epilepsy.

2. Journal of Mental Pathology, New York, Vol.VII, No.3

Along with this class of peripheral reflex cases are to be included the cases of epilepsy due to alcohol, leadpoisoning and uraemia.

Epilepsy due to trauma may also be included, but this usually is a form of Jacksonian epilepsy, the treatment of which will be considered afterwards.

Before leaving the subject of reflex causes, it is necessary to state that there are a large amount of cases, especially in infants and growing children, which present convulsions epileptiform in nature, associated with a reflex cause. These may not be true epileptic attacks, but they approach them very nearly in many cases, a point suggestive enough when one considers in how large a proportion of adult epileptics one is able to find a history of convulsions in childhood. In these cases diet and training will be of the greatest service, a point considered under "Prophylaxis".

Dismissing this small group of cases where the way is so plain to the observant, one comes to the large dominating class of epileptics - those suffering from true or idiopathic epilepsy. The treatment of this falls along three distinct lines:-

- I. General.
- II. Medicinal.
- III. Surgical.

I. In treating of the general management of epilepsy, one refers more to the treatment of the individual than of the disease. This is a subject which is growing every day in importance, and forms a line of treatment which is rapidly outstripping the medicinal in a certain class of case. Epilepsy is a disease, in the treatment of which, complete control of the patient is essential, and the hope of amelioration of the disease depends on the degree  
(1)  
of control.

It is probable that the physician will be consulted on the care of a child which has shown convulsive tendencies. If there be a neurotic family history, his responsibility is onerous, and only by having an almost autocratic management of the general care of the patient, can he hold out an expectation of successful treatment.

(a) Prophylaxis:

In young children who have suffered from convulsions and whose parental history is a bad one, general tonic treatment is essential. The child should have plenty of open air, and fresh breezes,

seaside if possible, supplemented by salt baths<sup>(1)</sup> and attention to any determinant or correlated cause such as rickets.

The diet should be regulated and care taken that not too much milk is given, and gastro-intestinal fermentation set up.

Special attention should be devoted to the state of the circulation, cold extremities being a very constant symptom wherever the convulsions threaten to become periodic<sup>(2)</sup>.

In older children where the convulsions have persisted so that one has certain mental reservations in avoiding the name epilepsy, diet is of supreme importance. The idiosyncrasy of the child must be studied, but generally speaking a mixed diet will be found most suitable. Irritating foods must be avoided and digestible foods recommended. Meat is not necessarily to be banned, as starchy diet is much more probable to cause fermentation and intestinal troubles. On no account must the child be overfed because of the mother's indulgence. A plain breakfast of cocoa with egg and toast, a dinner of cooked beef or mutton or poultry with vegetables and stewed fruit, and for tea, cocoa, toast and treacle or honey, will form a suitable basis for dietary in most cases.

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1. Ashby, Lancet, January 21, 1905.

2. Eustace Smith, Lancet January 24, 1903.



The important question of school is often put by parents. Here again one must judge by the individual. If the boy is likely to be annoyed and rendered ashamed by the banter of his fellows, he had better remain at home. If he be hardy and not likely to suffer, he had better be at school. On no account ought he to be allowed to "run wild for six months". Discipline and control is necessary, if only to prevent self-concentration. The neurotic child must not be allowed to feel that he is the first to be considered. He must have daily employment with a certain amount of outdoor exercise. On the other hand extra strain, such as excessive examinations, should be avoided. Physical exercises and baths should take an important part in prophylaxis.

(b) Home Control:

It is impossible to draw a dividing line, in the case of children, between seizures which are eclamptic and those which are epileptic. All convulsions in children qua convulsions are similar, and usually "the decision is made by reference to their supposed aetiology<sup>(1)</sup>". With the question of diagnosis one is not now concerned, other than to remark that often the age of the patient is a

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1. Moon. Observations on convulsions in children and their relations to Epilepsy. Lancet, Dec. 24, 1904.

determining factor. And it is on this that part of the treatment hangs, depending on the age, intelligence, and character of the individual. One is guided also by the presence or absence of stigmata of degeneration, especially as an index of the mental deterioration of the subject. The majority of mentally defective epileptic children show these to a decided degree.<sup>(1)</sup> Wherever possible one may make a thorough examination of the mental state of the patient. Having reached a conclusion as to the aid which one may receive from the patient himself, the question of home v. colony life may be determined. If the active co-operation of the individual can be depended upon, or in younger cases, the active aid of the patient's family, an attempt should be made to carry out the treatment at home. Even then it is not to the patient's best advantage to be thus treated, unless a skilled nurse or specially trained attendant be put in charge of him. The inadvisability of keeping an invalid child of this variety at home is nevertheless great in many cases. Apart from the influence unconsciously exerted on his immediate associates, the danger from assault is often sufficient to render his presence a menace. And it too often happens that the misplaced parental sympathy overrules the necessary and wholesome discipline which the growing

1. Aldren Turner. Royal Medical and Chirurgical Society. Lancet, Feb. 18, 1905.

epileptic stands so much in need of.

It is not only because of their headstrong and depraved tendencies that this is indispensable. The inter-paroxysmal state is unquestionably part of the disease, and has been shown not to be a result of the seizures alone, but "an expression of the same hereditary degenerative influences which give rise to the convulsion."<sup>(1)</sup>

In this state the mental attitude of the patient is made apparent, and the moral obliquity which may be most evident in the pre- or post-convulsive stages, is often manifested in a more or less constant degree. This is undoubtedly improved under the influence of self-restraint but more so when the latter is fostered by proper disciplinary methods. And to teach the epileptic self-control is to put one of the most valuable remedial agents in his possession. The means through which this may be accomplished are mere modifications of those adopted in the institutions about to be considered.

#### (c) Colony Life:

This is the most desirable and satisfactory solution for securing the fullest control of the epileptic. He may either be placed in an institution specially reserved for selected cases or open

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1. Turner. Transactions of the Royal Medical & Chirurg. Soc., Vol.LXXXVII.

for all types of the disease, except those insane. The latter class are at present sent to the lunatic asylums, a method of disposal which one hopes may not be accepted as final.

The best known examples of these colonies are the Bethel Colony in Westphalia, the Craig Colony in New York, and Chalfont St. Peter's, the last being for selected cases only. The advantages of all such institutions organised on this system are that they provide a suitable home-life for the patient, they preserve his individuality and they teach him an occupation, and educate him. The site of such a colony should be away from a town and the estate should be a large one. The patients are taught a trade and attend classes for their intellectual instruction, and are allowed plenty of time for exercise and amusement. The regular employment outdoors, the avoidance of excitement, and well ordered abstemious mode of life is productive of most beneficial results even in the adults. The patient is not made to feel that he is in a class apart - unlike his fellows - and in the case of boys or youths, the disadvantages of separate education, such as is often necessary if the patients are treated at home, are overcome. He is now educated under skilled supervision, and allowance is made for the variations that occur in his capacity



to learn, and patience employed in the reiteration which is necessary. Economic and therapeutic reasons combine in the endeavour to teach the patient a trade, and present him with a practical knowledge less easily dissipated by a convulsion than intellectual knowledge only. The advantages of outdoor occupation and physical exercise are of great importance - a point referred to later - and constitute a valuable remedial adjunct, and the benefits of music of which epileptics are very fond, and of stage-plays can be provided. And epileptics are enabled to follow, under supervision, such occupations as engineers, machinists, firemen, etc. which would be quite unfitted for them elsewhere. Mentally deficient children are taught on definite lines, co-ordination of muscular movement being aimed at first, and gradually leading to the promotion of the manual and mental activities. When one notes the fact that at present many mentally defective epileptic children are annually sent to lunatic asylums, because of their dangerous tendencies alone, it is made evident by contrast in how many ways the colony life can benefit such unfortunates, besides ensuring that, where dangerous tendencies develop, suitable precautions and means are at hand. And, where, for such of the patients that have mind enough to exercise self care at any rate, confinement is voluntary,

records show that few leave the colony without permission.

Indoor exercises such as printing, painting, shoemaking, clay modelling, carpentry, basket and brush making are all suitable and encouraged. But out-door work is accounted the most beneficial,<sup>(1)</sup> and dairying, gardening and farming are most admirable and provide the best results.

It is not the least argument in favour of colony treatment that it is in such institutions most of all, where medical progress is likely to be advanced, by reason of favourable circumstances

#### (d) Education and Occupation:

One may be confronted with this subject in the case of a lad showing no mental deficiency but subject to occasional seizures. Again one must judge by the individual.

Turner lays down for guidance the following ruled:-

1. If there be only nocturnal fits or at long intervals, epileptics may be educated along with healthy children.
2. If the fits be frequent and severe, or supervision is necessary, there should be separate education.

In the case of feeble-minded but not idiot children he recommends colony treatment.

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1. Gowers, Spratling, Aldren Turner.  
Gibsons Textbook of Medicine, Vol.II.

As to occupation, choice is limited. Outside of institutions, one is reduced to sedentary occupation as a recommendation, but the out-door occupations mentioned under colony life, may in some cases be followed, and are likely to be most beneficial. Occupations taking the sufferer up heights, near machinery, or close to fires, are to be condemned.

(e) Marriage:

This question presents itself in two respects, as regards the individual, and as regards the probable offspring.

Authorities are at one in stating that no benefit is likely to accrue to the individual from the married state as far as the disease is concerned. Marital relations have no effect on its progress, though pregnancy may have a temporary beneficial effect.<sup>(1)</sup> Parturition and the puerperal state on the other hand are not rendered more dangerous.

As regards the second question, it is undoubted that the marriage of epileptics puts a great premium on the creation of epileptic progeny. Spratling, discussing the question, has reached the conclusion that it is best that epileptics should never marry.

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1. Gowers. Epilepsy p.212.

Gowers would raise no objection in cases of organic epilepsy or where the disease was acquired, or arose as the result of a local lesion in the brain. In idiopathic epilepsy, if either potential parent is a sufferer from this disease and there is a hereditary history of insanity, suicide or epilepsy, the union is to be deprecated.

Where there is no such history and where a history of infantile convulsions is obtained and other evidence pointing to rickets or some other agent as a determinant cause, marriage need not be prevented. And where the disease develops later without adequate cause, it is difficult to give advice but marriage ought not to be encouraged.

It must be remembered that the question is likely to be put only by those who are conscientious, so that after hearing the facts of the history, and candidly stating the prospects, the decision may be left to those concerned. There can be no doubt of the danger involved where there is a history of insanity or epilepsy. In a series of 2400 cases Gowers<sup>(1)</sup> found inheritance in 40%. In a series of 1000 cases Aldren Turner<sup>(2)</sup> found inheritance in 57%, while the writer in a series of 180 insane epileptics in whom the fits developed after the age of 10 years found inheritance of this sort in 22%

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1. Gowers. Epilepsy, 2nd Edition p.3.

2. Lancet, March 18, 1905.



and in the case of 60 epileptic idiots and patients who developed the epilepsy before the age of 10 years a history was present in 30%, and an epileptic inheritance in 25%. Several cases were admitted to this Asylum (Devon) in which the fits commenced after marriage, both males and females, and several who stated the fits had become more frequent since marriage. That it is not uncommon for epilepsy to develop after marriage may be noticed from a consideration of the history of the cases described hereafter under "diet" where four female patients admitted in the past five years out of the ten mentioned, developed epilepsy subsequent to marriage. It is probable that in these cases marriage must be looked upon as an accident not affecting the onset of the disease, which itself is probably the manifestation of hereditary influence.

(Insanity was traced in one case only).

Gowers has drawn attention to the difficulty experienced in tracing a history in the poorer class of cases, and observers are agreed in stating that the percentages are probably much higher than can be obtained. Mindful of being drawn into the question of etiology, one may state that from the study of the records of patients in this Asylum, if an adult contemplating marriage, be the subject of epilepsy, not only are the possible chances of sound progeny

unlikely, but in the presence of hereditary history of either party to the marriage being tainted by alcoholism, phthisis, or syphilis, and much more so insanity, they are so improbable that the physician cannot for one moment dream of withholding his disapproval of such a step.

(f) Diet:

It is well-nigh impossible to discuss the influence of diet in this disease, without referring to the various theories of causation. The influence of indigestible food in causing convulsions in children has already been referred to, as also the effect of gastric disturbance as a so-called reflex cause. There are authorities, however, who claim for diet a much more important role. Haig in his book "Uric Acid in Causation of Disease", is inclined to regard an accumulation of uric acid in the blood as the cause of the epileptic convulsion. Hare in "The Food Factor in Disease" advances the suggestion that hyperpyraemia is the determinant factor. Both advance arguments and illustrations convincing enough to indicate that at least in some instances their conclusions are correct. But it cannot be maintained that the same causes are operative in every case. DrMcLane Hamilton<sup>(1)</sup> in an article on epilepsy

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1. Medical Record, New York, 3 Dec. 1904.

due to toxaemia, pronounces the latter to be the excitant of the discharge from the cortical cells and states that the toxaemia is probably a combination of auto- and hetero-toxaemia. The auto-toxaemia. The autotoxaemia occurs in three ways:-

1. From gastro-intestinal derangement setting free purins and putrifaactive products.
2. Straphylococci in the blood.
3. Poisoning of the nerve cells by degradation products of nervous tissue, e.g. cholin.

This substance, a disintegration product of lecithin has been found in the cerebro-spinal fluid of epileptics<sup>(1)</sup> as well as those suffering from general paralysis and tabes. It is singular, however, that Hamilton, Aldren Turner, and I, Turner are convinced of the essential presence of some deprivation of arterial blood as the provoking agent on the cortical cells. This it may be pointed out is not in contradiction of Haig's doctrine, as he has emphatically commented on the similarity of epilepsy and migraine. The theory of vaso-motor spasm has been discarded by Leonard Hill<sup>(2)</sup>, however, who says it must be withdrawn from pathology. Hamilton says "most is to be feared from a soft, rapid pulse". On the other hand bradycardia is often associated with epilepsy, and suggests relationship with Adams-Stokes disease. Onuf<sup>(3)</sup> in a

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1. Donath. Ref. by Turner, Lancet March 18, 1905.
  2. Leonard Hill. The Cerebral Circulation.
  3. Onuf. Ref. Lancet, 20 May, 1905.

series of post-mortem examinations on epileptics found the mitral valve affected in 60% of the cases, and in 80% of those suffering from cardiac lesions. The writer has frequently felt the pulse cease at the commencement of the tonic stage of a convulsion, and in nearly every case has noticed a fall of tension immediately preceding. Reference has already been made to the association of defective circulation with convulsions in children, and to the beneficial action of Nux Vomica in many cases of idiopathic epilepsy. One must not, however, forget the effects the convulsions may produce by causing excessive strain on the heart. As the evidence for a toxaemia, represented by changes in the urine excreted before and after a fit, numerous observers are by no means agreed. The urine passed after a fit has been found to be hypertoxic, as gauged by injection into rabbits.<sup>(1)</sup> The theory was forwarded that the paroxysmal increase in toxicity of the blood brought on the fit, and that thus the urine passed after the fit, contained the toxic substances freed from the circulation. Unfortunately for this proposition, recent research has failed to confirm the results of Voison. Experiments based on a supposed toxicity of the blood have also failed.<sup>(2)</sup> As to the reaction of the blood, it seems to be settled that there is a fall in alkalinity of the

1. Voison. Ref. to by A. Turner, Lancet 18 March 1905 and by Haig, Uric Acid, p.295, et seq.

2. Turner. ref. to Hebold, Bratz, Hester, Lancet 18 March, 1905.



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blood immediately prior to a fit. Whether this is due to retention of uric acid as claimed by Haig, or formation of Carbamic Acid, (Krainsky) or to the presence of acid toxins of a nature as yet undetermined, remains improven. That in many instances the seizure is to be looked upon as an effort of Nature to rid the organism of some toxic substance in the blood is nevertheless, a feasible and natural deduction.

It cannot, however, be reasonably maintained that all epileptic manifestations are accountable on the basis of an auto-intoxication, especially when the influence of heredity has been accepted, and the stigmata of degeneration are present, nor can it be assumed that an excess of uric acid is the sole cause of the fits. Haig himself has proved that the amount of uric acid in the system can be controlled by diet, and epileptics on a purin-free diet may show no benefit from it. On the other hand, an alteration in the diet may be of the greatest value to the patient, and no diet is likely to be more beneficial than one free of purins. The works of Walker Hall and the many contributions of Alexander Haig have greatly enhanced common knowledge of this subject.

Spratling has stated that recovery is only to be spoken of when patients have been free from

attacks for two consecutive years, but both Aldren Turner and Haig have recorded cases apparently cured by the administration of a purin free diet. Turner<sup>(1)</sup> gave his cases in addition a dose of Sodium bromide at bedtime, and Haig preferred sodium salicylate.

Bearing in mind the fact that mental degeneracy might greatly impair the value of any experiment, the writer selected 10 cases of epileptic and insane patients of varying duration and subjected them to a test of the efficacy of a purin free diet.

Subjoined is a brief record of the cases:-

#### Case I.

S.P. Admitted to Asylum, November 1904. Age 60. Married 37 years. No children. Has suffered from epilepsy for 32 years. Treated since admission with Aspirin, bromide of potassium, and a mixture of Pot.brom. and salicylate of soda with varying results. State of mind - Dementia.

#### Case II.

S.T. Admitted to Asylum 25th February 1906. Aged 40. Married, seven children. Suffered from epilepsy for 18 months. Says fits come on at menstrual periods. Treated after admission with mixture of pot. brom. and salicylate of soda.

State of mind - Excitement after fits.

1. Practitioner, April 1906. Uric Acid, p.305.

Case III.

S.S. Admitted to Asylum, February 1906.  
 Age 42, Widow, no children. Suffered from epilepsy "several months". Mental state - Excitement with delusions of persecution. Violent.

Case IV.

L.M. Admitted to Asylum, April 1906. Age 26.  
 Single. Suffered from epilepsy - nocturnal - for seven years, but has had no fits for past month.  
 Mental state - Excitement and eroticism.

Case V.

K.R. Admitted to Asylum, April 1898. Single.  
 Age 32. Suffered from epilepsy from 6 years of age.  
 Mental state - Mental deficiency, aggressive and violent.

Of the above cases No.I. and No.V. had had various medicinal remedies administered at different periods during their residence in the Asylum, but none had been treated medicinally after January 1906, with the exception that all had sod. brom. substituted at table for sod. chlor., and all during the period in which they had the purin free diet had no medicine whatever, some an occasional aperient. The remaining five cases were for two preceding months and throughout the period of dietetic treat-

ment taking

Sod. Salicylate, gr. xx. ) three times  
Pot. brom. gr. xxx.) daily.

Case VI.

M.S. Admitted to Asylum July 1904. Single.

Age 27. Suffered from epilepsy for 11 years. Mental state - Arrested development, excited and violent after fits.

Case VII.

E.B. Admitted to Asylum August 1903. Single.

Age 22. Fits for years. Mental state - Excitement, with periods of violence and suicidal tendencies.

Case VIII.

H.A. Admitted to Asylum December 1905. Single.

Age 20. Suffered from epilepsy for seven years. Has been to the Colony at St. Peters. Mental state - excited, violent, suicidal. Arrested development.

Case IX.

M.C. Admitted to Asylum May 1902. Married.

Age 38. Had suffered from epilepsy for two months previous to admission. Mental state - Excitement.

Case X.

E.D. Admitted to Asylum December 1901. Married.

Age 44. Suffered from epilepsy for 30 years.



Mental state - Arrested development with periods of excitement.

These ten cases were on May 6th, 1906, ordered a purin-free diet. The ages given above refer to their age on this date. Most of them exhibited both forms of seizure, petit and grand mal, and all suffered from the nocturnal variety of fit, Case I exhibiting this form only, while the others suffered from diurnal fits as well. These patients being in the same ward of the institution and subject to the same set of governing conditions, the experiment looked a promising one as the remaining patients except for diet were also subject to the same external circumstances, and several were on precisely the same combination of sod. salicylate and pot. brom. as the last five of the above cases.

Noel Paton in an article on Dietetics in the Practitioner, April 1906, quotes an extensive series of researches by Atwater proving that a man with light muscular work requires 3,000 calories per diem. Taking the requirements of a woman as .8 that of a man, one finds that she requires 2,400 calories daily. It is a generally accepted statement that 3.5 grs. of urea per lb. of body weight is a fair allowance. This multiplied by three will give the amount of proteid required to produce it. Having

taken the weight of the person involved, and deducted the probable weight of fat, a multiplication by 3.5 and then by 3 will give the requisite amount of proteid required for nourishment. The heat value of proteid, carbohydrates, and fats is as follows:-

1	gramme	of	proteid	=	4.1	Calories	of	Energy.
1	"	"	Carbohydrates	=	4.1	"	"	"
1	"	"	fats	=	9.3	"	"	"

With regard to the foods free from purin bodies, bearing in mind the researches of Walker Hall on breadstuffs and the existence of a large amount of xanthin in oatmeal, it was found that the dietary could be but little varied. The following dietary was finally adopted which will be seen to contain more than enough for the daily requirements of a female of 140 lbs.

Breakfast:

$\frac{1}{2}$  Pint Milk, 6 oz. bread,  $\frac{1}{2}$  oz. butter,  $\frac{1}{2}$  oz. Sugar.

Dinner: (mid-day)

1 Pint Milk, cheese, rice pudding, bread 4 oz.

Tea:

$\frac{1}{2}$  Pint Milk, bread 4 oz., Jam,  $\frac{1}{2}$  oz. butter.

If the patient did any ward work she was allowed lunch consisting of bread and cheese or jam and milk.

To breakfast and supper the milk is heated and mixed with an equal part of hot water. The amount

of cheese allowed per diem was 2 oz. Every week the pudding was changed so that rice was replaced by sago and by tapioca. The average daily allowance was as follows:-

Bread (White)	.....	14 oz.
Cheese	.....	2 oz.
Rice Sago or Tapioca	.....	3 oz.
Milk	.....	2 pints.
Jam	.....	2 oz.
Sugar	.....	1 oz.
Butter	.....	1 oz.

Some difficulty was experienced at first in gaining the assistance of the patients themselves. Prone to complain, to imagine themselves hardly used, and liable to irritability, some considered the "white diet" a great hardship. They clamoured for meat and tea, a significant point, as all epileptics are voracious meat eaters, and most are gluttons if allowed their own way. The less affected mentally of the patients complied hopefully when it was pointed out that it was to their probable advantage to have this diet, and immediately wrote to their relatives and friends not to send tea, cocoa or chocolate sweets to them. After a week's treatment they were all hopeful of cure, and talked cheerfully of the diet, and throughout the six months during which they had it, there was less irritability on the whole amongst all ten patients. Taking the number of fits as a criterion of the results of treatment, it cannot

be said the diet proved greatly successful. It has to be borne in mind, however, that one cannot expect much in cases of epilepsy where the mind has been impaired, and that in these cases the mental state is really of more importance than the number of fits.

Case I. showed an increase for the six months but had a series of 23 fits on September 7th, which was arrested by a dose of bromide, chloral and opium.

Case II. could not be contrasted with a previous corresponding period as she was a recent case, but she showed no improvement in her mental state.

Case III. proved very irritable during the first two months of treatment and required seclusion on 4th June by reason of her violence. She had no fits after the end of July and her mental state improving, she was discharged on 4th December 1906.

Case IV. had no fits throughout and showed slight mental improvement. She has since for four months been on an ordinary mixed diet, and though she has had no fits is subject to periodic attacks of excitement and violence.

Case V. showed a reduction by quarter in the number of fits and was of a more tractable disposition during the six months she was on the diet.

See Chart No.I appended.



Case VI. who had "serial" fits as a rule, showed a reduction during the period on diet, her highest total in one week being four, and previous to this but while taking medicine it was eight. She suffered less from confusion and stupor also.

Case VII. also showed greatest reduction of fits during the period she was on diet, this being most marked during the first month of treatment. She became more even tempered also.

Case VIII. showed no farther reduction under the influence of diet. Her fits were mostly nocturnal and were reduced only on the medicine being given at bedtime - a double dose - instead of thrice daily. The effect of the diet alone seemed to be if anything in the direction of an increase in the number of fits.

Case IX. had only one fit during the period she was on diet. She had only two during the period of nine months she was on medicine, so that the effect of the diet was doubtful, but probably beneficial.

Case X. showed much the same result as the previous case. She also had tendency to "serial" fits, eight being the highest number on medicine alone, and six while on diet in addition. With one other fit, this made up her total.

It will be noticed that of the ten patients under observation, six showed a reduction in the number of fits, in two the effect is problematical, in another the diet effected no farther reduction, and one showed an increase. With the exception of one case all were benefitted mentally, one patient recovering entirely.

On looking at the accompanying charts, it is well to note the fact that while the patients were taking the purin-free diet, they had no salt nor the substitution, sodium bromide. The effect of the latter can be noticed on Chart I. on the patients before and after the period of dieting. The patients who were having medicinal treatment in addition show the reduction well marked. There is a rise at the withdrawal of the diet, and a more marked one at the withdrawal of the medicine, a point referred to hereafter.

There are several other points for discussion in connection with the above dietary.

It is noticeable that a fair amount of fluid is present in it. On a basis of toxaemia it might be supposed that the administration of fluid might be beneficial as in for example the treatment of typhoid fever suggested by Debove, and recently successfully carried out by Cushing and Clarke <sup>(1)</sup>,

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1. Claude Ker, Practitioner, December 1906.

showing marked improvement in results by giving liberal amounts of water. This point having occurred to the writer, a number of patients were subjected to a test as to the efficacy of water drinking, with the result that improvement was noticed. However, it is to be noted that the majority of epileptics drink large quantities of water as a rule, just as they show strong partiality for meat, and devour large amount of salt to their meals. This fact then does not detract from the value of the diet, as probably epileptics take as much fluid voluntarily when on an ordinary mixed diet. As to the diet usually given patients in this institution, the appended copy shows the ordinary allowance. See Chart IV.

On perusing the table, one notices there are a fair amount of xanthin containing foods. On the other hand there is little of an irritating nature in the diet and it is one quite suitable for many epileptics. It does not contain indigestible food and does not differ much essentially from many dietaries used in epileptic colonies. As to the conditions under which it is taken, there are no detrimental factors. The patients are not allowed to eat at irregular times, they are not hurried or allowed to bolt their food, and they are not allowed to overeat. Spratling<sup>(1)</sup> says he has not been able

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1. Epilepsy, p.354.

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to determine that different foods have any specific effect on epilepsy. He advances arguments for a mixed diet, and seems to regard pastry, cabbage, and, generally speaking, indigestible and irritating food as much more to be banned than meat or purin producing foodstuffs. In fact he asserts that most epileptics can eat meat not only with impunity, but with benefit. Milk he regards as the best drink, but he allows cocoa and chocolate, which contain purin bodies in a fair proportion.

The dietary he recommends does not in effect differ essentially from the above mentioned table, with the exception that in the latter cabbage and meat pie containing dripping appear. The times for meals practically coincide and the last meal satisfies his condition in being the lightest of the day, and in being taken not less than one hour and a half before retiring. It is evident, therefore, that the comparison of the purin-free diet was with one regarded by some authorities as nearly the best possible for epileptics, and closely approximating to that recommended under prophylaxis. It is all the more striking in consequence that the ten patients recorded such progress. Hare<sup>(1)</sup> claims hyperpyraemia as a potent factor in epilepsy and recommends a diet consisting mainly of lean meat, green non-starchy vegetables and gelatinous soups. His

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1. Food factor in paroxysmal neuroses, Practitioner, February 1906.

results in the treatment of epilepsy are:-

1. In no case were the paroxysms more frequent or more severe.
2. In many cases the paroxysms were less severe.
3. In some cases the paroxysms were rendered less frequent and less severe.
4. In a few, without any drugs, the paroxysms ceased.
5. In the great majority the inhibitory action of the bromides seemed to be enhanced.

Chittenden<sup>(1)</sup> in his experiments on soldiers to whom he gave a diet with the proteid limited to half the amount (120 grams) formerly considered necessary, found that they excreted uric acid of endogenous origin only, that is, reacted as if their diet had been purin free. Eve<sup>(2)</sup> in referring to this and the investigations of Fletcher and Someren inclines to the theory that a purin-free diet owes much of its efficacy to the fact that the quantity of nitrogenous food is diminished. One can only reconcile this with the statements of Hare, if one subscribes to the theory that the majority of persons eat too much, not only nitrogenous, but carbonaceous food, though Hare<sup>(3)</sup> himself says Haig's success with a purin-free diet is due to the reduction of proteid and not of purin intake. And this view that it is

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1. Physiological Economy in Nutrition, 1905.
  2. Uric Acid and Diet. Practitioner, December 1905.
  3. Practitioner, February 1906.

the absolute quantity of proteid matter and not meat or special food which forms the dietetic factor of importance in epilepsy is corroborated by the inquiries of Rosanoff<sup>(1)</sup> of New York. His experiment was carried out on eleven patients. His conclusions were that the proteid material must be limited to that compatible with the preservation of nitrogenous equilibrium, and that if the amount be above or below that minimum, the severity of the disease is increased. It does not appear, however, that he tested a purin-free diet with a view to ascertaining its efficacy. McLane Hamilton in the article previously referred to, states that purins are to be rigidly avoided in the treatment of toxaemic epilepsy. And most authorities who have made trials with a purin-free diet have found it of benefit in some cases. Certainly all that Hare claims above for his diet can be claimed for this. And as it is one which can be continued for an indefinite period, it can safely be prescribed for prolonged use. As the articles of diet allowed can be found in any book dealing with dietetics and are enumerated fully in Haig's Uric Acid, it is needless to quote here. The following table shows the articles of diet prohibited by Haig and those by Spratling.

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1. Journal of Nervous & Mental Disease, December 1905. referred to by Lancet, March 10, 1906.

Haig.	Spratling.
Tea	Cake
Coffee	Raspberries & Blackberries (berries with hard seeds)
Cocoa	
Fish	Pastry
Fowl	Pork } Veal } or meat Ham } fried in grease.
Meat	
Peameal	
Lentils	Cabbage & Cucumbers.

Alcohol is generally forbidden, Spratling significantly adding "even the lightest beer".<sup>(1)</sup> It is known that beer can greatly increase the acidity of the urine, and reduces the alkalinity of the blood. And Haig has shown the increase in acidity of the urine that occurs after an epileptic fit.<sup>(2)</sup> Galdi and Tarugi<sup>(3)</sup> while confirming this arrived at the following conclusions:-

1. The increase of the acidity coincided with the diminution of the power to cause convulsions.
2. The power to cause convulsions is present in the urine passed before a fit, never in that passed after.
3. The acidity did not correspond to the toxicity of the urine.

1. Spratling. Epilepsy p.557.  
 2. Uric Acid, p.302 et. seq.  
 3. Il Morgagni, June 1904 referred to B.M.J. Sept. 24th, 1904.



They concluded that - on the theory of Ceni that epilepsy is due to two different substances - one of these is an acid substance circulating in the blood between the attacks, and stimulating the cells to produce a second substance, which has the power to cause convulsions.

And if one can accept the suggestion that beer, cider, and acid wines act by hurrying on this stimulation, one is provided with a feasible reason for rejecting them. In this connection it is useful to notice the locality prevalence of epilepsy. Clouston<sup>(1)</sup> draws attention to the comparative scarcity of this disease in Scotland and the northern counties of England, where work is plentiful and wages high and where consequently, whisky and spiritous liquors are more frequently drunk, and to the high ratio of epileptics in the south of England where beer and cider are more indulged in. And this cannot be wholly explained away by referring to the Englishman's fondness for meat or for a more generous diet, as the Commissioners in Lunacy<sup>(2)</sup> give the following figures, in recording the average ratio of epileptics to all other insane patients admitted:

Private patients 2.6, Pauper 8.3.

Whether or not it be because of this reason or because of alcoholic stimulation being a possible excitant to the cortex, it is advisable that epil-

1. Mental Diseases, p.459.

2. Copy of Report (England) June 1905.

epileptics avoid alcohol in all forms, and the same applies to the use of tobacco, especially in young adults. In older epileptics smoking may bring a calm that patients often stand in need of.

(g) Salt-Starvation:

The suggestion of substituting the bromide salts for the chlorides in the dietary of epileptics is due to Toulouse and Richet, who recommended a diet in which the total quantity of sodium chloride per diem was limited to one or two grammes. It was found that in this way the amount of bromide might be diminished, and the risk of bromism lessened. The ordinary treatment by bromides was also rendered more efficacious. Turner<sup>(1)</sup> found that by this treatment, the number of attacks were diminished, and in some cases improvement lasted after the diet had been stopped. He, however, used the diet recommended by Balint which contained no meat, fish, fowl, and many of the farinacea, so that his results may be explained in another way. Voisin and Krautz<sup>(2)</sup> showed that deprivation of chloride alone had no appreciable effects on the paroxysms, but that they could be reduced by 69% by the combined administration of sodium bromide, and they recommend an alternation of 15 days salt starvation

1. Lancet, March 18, 1905.

2. Ref. to by Lancet, January 7th, 1905.  
Ref. to by Lancet, July 9th, 1904.

with two months ordinary diet. Toulouse tested patients, some on milk and some on ordinary diet, with varying doses of sodium chloride, but could determine no effect on the frequency of the fits, even when 25 grammes were given daily.

To carry out the treatment effectually, bromopan or bread baked with sodium bromide is necessary but much may be done by ordinary substitution at the meal table. The difference in taste is never detected, and epileptics are prone to use large quantities of salt. Thirty-two patients have been treated in this institution by the writer in this way for over ten months, and while some have been dieted on purin-free diet, others treated with sodium salicylate and bromide, sixteen have simply been treated by this method of salt-starvation. In no instance has bromism occurred, or the rash been noticed, and all have shown a reduction in the number of fits, and while a few have been more irritable, none have shown the melancholia or delirium described by Voisin & Krautz. Indeed the majority have shown mental amelioration. Chart III. shows the total amount of fits monthly for eleven months before the dechlorisation and after. It records the paroxysms in 16 cases otherwise untreated. A reference to Chart II. shows the effect produced in enhancing the value of the sod-

salicylate and bromide, while Chart I shows that in Case I S.P. who did not improve while on purin-free diet, a return to the salt starvation treatment caused an immediate and sustained reduction in the number of fits. It is probable, therefore, that in her case, the epilepsy is not of the nature of a toxaemia. And it is to be observed that as none of the patients on the purin-free diet had any salt during the period of trial, bearing in mind the results of Voisin & Krautz, before referred to, that the essential part of the dechlorisation treatment consists in the administration of the sodium bromide substituted, no possible objection, therefore can be raised to the results of the dietetic treatment, that it was due to the removal of the salt.

Chart IV. shows also the farther reduction in fits caused by the salt-starvation, when added to the effect of medicine, as also Chart V.

#### (h) Water-drinking:

Comment has already been made on the fondness of epileptics for water drinking and a reference has been made to the efficacy of giving them a copious allowance. Six patients were ordered 5 pints of water daily, given in quantities of  $\frac{1}{2}$  pint every hour during the time they were up and about. Up to the time of writing this has been carried out for



nine weeks and the results are encouraging especially as regards the mental condition of the patients.

The following table shows the effects produced.

Patients		Fits during treatment.	During previous 9 weeks.
Improved	5	69	102
Not improved	<u>1</u>	<u>101</u>	<u>90</u>
Total	6	170	192

The patient who did not improve was a case of nocturnal epilepsy, and it is noteworthy that she did not improve on diet.

(See Case VIII. page 28).

Omitting her, the total reduction in the other five cases is one to 67%.

It is known that in the administration of bromides, if the doses are given with a large amount of water, much more beneficial results are obtained. In the above instances the patients before and during the hydric treatment were also undergoing a course a dechlorisation, so that much of the improvement might be explained in this way. It is a point which will be the subject of future observation.

(i) Baths:

But the benefits of treatment by water do not end with its internal administration. Experience in the treatment of febrile diseases has proved the efficacy of bathing as a means of elimination of toxins. And this applies also to epilepsy. The Turkish Bath has been found very useful in preventing the onset of seizures<sup>(1)</sup> and many writers have recorded recoveries. Fleury<sup>(2)</sup>, after enumerating the classes of cases in which benefit is most likely to be observed, makes the following remark: "Of all methods of treatment for epilepsy now known, hydrotherapy offers the most numerous and surest chances of success."

No doubt the action of the baths has a powerful effect on the circulatory and vaso-motor systems, and exerts a favourable influence upon the brain and cord. Foster<sup>(3)</sup> in referring to previous workers on the subject, affirms that improvement only becomes marked after three months of treatment, and gives the results obtained by himself in 12 cases treated for periods varying from 5 to 23 months, all being benefited, the average reduction in fits amounting to 39.8%. He is in agreement with Bottery, Fleury and other hydrotherapeutists in stating that this method of treatment has a favourable action on the influence

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1. H. R. Niles, American Journal of Insanity, January 1899.
  2. Traite Therapeutique et critique d'hydrotherapie, 1875.
  3. Hydric treatment of the insane. Amer. Journal of Insanity, April 1899.

of bromide medication, in facilitating and regulating the absorption of the drug, and consequently enabling smaller doses to be employed as satisfactorily, and on the other hand by increasing elimination, it enables larger doses to be administered, and brings about an increased tolerance for the bromide salt. The literature of the treatment of insanity teems with references to the beneficial action of baths in certain cases, but in the hands of unskilled agents, they are not so likely to be successful, and it is true of any experimenter<sup>in</sup> <sup>^</sup> this mode of treatment, that he is on trial much more than the method which he employs. It demands great care and requires skilful assistance and thus is only suitable in certain institutions. Its more common and not less useful method of employment is as an adjunct to treatment by physical exercise, another mode of treatment which by its general tonic action on the circulation and sympathetic system, its reactions on metabolism and on the excretory functions, plays a useful role in promoting elimination and enhancing the effects of medicinal agents.

#### (j) Exercise:

Physical exertion is one of the most influential modes of treatment in all chronic diseases. It is one largely employed in Asylums in the case of

dements and the chronic insane, including patients who are also epileptic. It is usually attended with the happiest results. No doubt a great factor operating early is the improvement obtained in gastrointestinal disorder. Carlisle,<sup>(1)</sup> in an instructive paper on exercise for the demented, emphasises the importance of a superabundance of fresh air, and the results of colony life for epileptics confirm this. White,<sup>(2)</sup> referring to the facts that epileptic fits appear in Asylums to be more numerous in winter and spring, and also that though day fits are more numerous than night ones in females, the opposite is true of males, suggests that this is due to the effects of physical exercise in the male patients. He states that the more indolent the epileptic the more numerous are the fits. And Spratling<sup>(3)</sup> emphasises the value of outdoor exercise as a remedial factor. "On holidays and rainy days" he adds, "when patients were compelled to stay indoors and could not engage in any occupation, the number of seizures doubled. This fact is absolute." And elsewhere<sup>(4)</sup> he states, "it is generally better to educate the epileptic in a physical or manual way, than in a way purely intellectual."

Gowers<sup>(5)</sup> records cases where arrest of a fit takes place by physical exertion, and explains it as

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1. American Journal of Insanity, April 1903.
  2. Journal of Mental Science, January 1900.
  3. Work at the Craig Colony. Amer. Jour. of Insanity, October 1898.
  4. Epilepsy. p.347.
  5. Epilepsy, p.111.



a means of relieving tension in the motor areas. But the means by which exercise in the way of occupation or games acts when spread over a long period must be through the general tonic influence exerted on the vaso-motor and excretory systems. And the records of the Craig Colony show that attacks among males are always less in summer, and that females because of their sedentary life do not show the same improvement. And Turner<sup>(1)</sup> records that at the Chalfont Colony fits are less frequent at the end of the day, and most frequent in the first hour after getting up. More also occurred indoors than out. These facts are significant and speak for themselves.

Amongst insane epileptics, the writer has noticed that those capable of doing out-door work, were much annoyed if prevented from doing this from whatever cause, and that they assert how much better they feel for the exercise. And farther on an endeavour will be made to show that many external factors in the production of seizures may be explained in terms of physical exercise. The danger of stasis or cerebral anaemia referred to previously is averted by its means, as also any tendency to coagulation of the blood. It is recognised that this tendency is increased by the application of heat, and in this connection it may be possible to explain the

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1. Gibsons Medicine, Vol.II.

increased number of fits which female patients show in the summer months. In this Asylum the female patients are never allowed to sit by the fire, as the attendants have noticed that this causes increased frequency of seizures. Statistics collected by the writer from the records kept in this institution show that the incidence of convulsions in the two sexes do not coincide, and that in the case of male insane epileptics, the least number of nocturnal fits occur in the first hour after going to bed, 8 - 9 p.m. Figures given by Spratling show that 3 a.m. is the hour at which most seizures occur, and that the next most dangerous hour is 9 p.m. It is just possible that this last is due to a preponderance of fits in females. The accompanying tables will show some of these facts more clearly. Gowers comments on the frequency with which fits occur in the first hour after rising and most persons who have any opportunity for close observation of epileptics are struck by the increased frequency of the attacks in wet weather. This may no doubt be to some extent explained by the lack of exercise enforced.

(k) Electricity.

This has been advocated in different forms by Féré, Althus and Fischer.

Hughes recommends treatment by electric light rays in a confined room. But it is difficult to see how such applications can benefit the disease, excepting indirectly by benefitting the general condition of the patient.

In concluding this, the general treatment of Epilepsy, one can but observe that most of the means indicated are successful in some cases only. It is likely that these are in many instances cases where the disease is toxæmia. It is just possible that by trying a patient with diet, exercise, or baths, one may in time be able to formulate a test for distinction between toxæmic epilepsy and that due to cortical degeneration. In the meantime it is well to point out that though the seizure is a useful criterion of the progress of the disease, its abolition is not the only end in view, and improvement in the mental and physical well-being of the patient is quite as important if not the chief end of the physician. It is at any rate the aim of those who have to deal with them in institutions, and it is unfortunate that often the only means that can be adopted by the practitioner is the use of drugs. In discussing the employment of the latter the writer wishes to point out that only too many of the epileptics on whom tests were performed, suffer from a fair amount of mental impairment and that his results may therefore not always obtain.

## II. MEDICINAL TREATMENT.

Drugs are administered in this disease for two purposes mainly, a reduction in the number of fits, or, failing that, a reduction in their severity. In addition they are sometimes prescribed to arrest the fit, or allay the headache and post convulsive symptoms.

### Prevention of an immediate attack:

If the aura precede the attack by a sufficient interval, attempts at arrest may be made. For this purpose amyl nitrite pearls carried by the patient are useful. One is broken in a handkerchief and the drug inhaled. This is preferable to carrying a sufficient quantity of the drug in a stoppered bottle. The remedy is supposed to act by flushing the brain with arterial blood.

In other ways arrest may be brought about, especially if the aura begin in an extremity. Ligature of the limb, carried out by tapes kept loosely tied for an emergency, may repeatedly prevent a seizure. And slapping the face and neck, exertion, pinching or blistering may be also useful, application of stimulation depending on the site of the aura. Sometimes ammonia held to the nostrils, or chewing ginger, may avert a convulsion in a similar way.



Hypodermic injection of apomorphine has succeeded in some instances.

Too often the patient is powerless to apply any remedy himself, or the interval is too short to allow of interference, and it is doubtful whether any benefit is derived by this procedure.

Management of an attack:

Constricted clothing about the neck should be loosened, and the patient should be turned on his side if vomiting threatens - to prevent choking. Some patients turn on their face during the convulsion, and this is a danger in nocturnal epilepsy if the patient is not under observation, as suffocation may ensue. The friends of a patient ought to be warned of this.

If the patient can be reached in time he ought to be laid on his back to prevent him from falling, and in some instances a piece of cork may be inserted between the teeth to prevent the tongue being bitten.

The post-convulsive stupor should not be interfered with. The headache can be relieved by salicylate of soda or phenazonum.

Excitement and sleeplessness when occurring in an epileptic patient are best treated by a mixture of bromide and chloral. If a hypnotic action alone

is wanted chloral hydrate grs.XX. and pot. brom. grs. XL. will be found most useful as a draught, but for excitement lasting over several days, the doses may be somewhat smaller and the addition of nux vom. or digitalis will be found beneficial, when the medicine is given twice or thrice daily. In some instances, cannabis indica and belladonna have proved most satisfactory adjuncts to the bromide in the writer's hands in this class of case, but in severe attacks, probably "equivalents", veronal and paraldehyde alone seemed to produce any immediate effect, and then only to a satisfactory extent when a purgative had been administered. In this intense motor excitement and restlessness much benefit is obtained by calomel, or a good prescription is (for a robust adult)

R<sub>x</sub> Ol..crot.  $\eta$  11  
 Tinct. Quillaiae  $\eta$  XX.  
 Paraldehyde.  $\zeta$  III.  
 Aqua ad  $\zeta$  II.                      Misce.  
 Sig: the draught.

Even alone croton oil is of benefit in cases where excitement is the precursor of fits, and then it may and often does abort the attacks. But when administered as above, sound sleep follows the profuse evacuations obtained.

Bromide Treatment:

Introduced by Locock 50 years ago, the salts of bromine are still the main resource of medicine in combatting epilepsy. Of these the bromide of potassium is the most commonly used and is of the greatest service, and while in some cases a combination may prove more beneficial, this is not true as a general rule. The bromides are to be looked upon in the light of a specific in this disease, as it is rare that any other drug proves successful where they fail. On the other hand, the greatest care is necessary in its administration, and individual idiosyncrasies regarded. To be of value, it should be administered over a long period of time, and the necessity for this should be pointed out to the patient. Any break is likely to cause a recrudescence of the disease. The action of the bromides on cases can be divided into three groups:

- I. A small group resulting in cure.
- II. A large group in which the attacks are reduced in severity and in number, but not arrested.
- III. A small group in which there is no influence for good.

In addition to the seizures, improvement is also shown commonly in the associated mental condition.

As to how bromides act, is not precisely known. Regarding epilepsy as an "abnormal readiness of the cells of the cortex for action", they lessen the tendency to spontaneous discharge. Gowers states that this discharge is due to the escape of atoms of the nerve substance to combine with the oxygen of the plasma, and this chemical action, bromide restrains. The efficacy of the salts does not seem to depend on the amount of bromine in each, as in that case, lithium and then ammonium bromide would be the most useful, but this is not borne out by results.

Still it is mainly in virtue of the bromine that the bromides have any restraining action on the seizures, and other salts of the bases are singularly useless. Bromine is a powerful disinfectant and it is by reason of this action that Spratling suggests the bromides effect their purpose. On the basis of a toxaemia, this proposition is at least as feasible as that of Gowers and others. And, at any rate, it brings it on a similar footing with borax, calomel and other remedies which are not without avail.

Observers are agreed that the potassium salt is the most successful, and it has certainly been so in the hands of the writer. Sodium and strontium bromide are hardly less so, but a long trial with



Ammonium bromide has been disappointing, and Charter-  
 is <sup>(1)</sup> has shown the last to be more toxic than sodium  
 bromide, and that the stimulating effect of the  
 ammonia in large doses counteracts the depressing  
 action of the bromine. On the other hand, it is  
 found that different salts are of varied efficacy in  
 different patients. And the different effects of  
 the bases are difficult to recognise in practice, so  
 that no more lowering results seem to follow the  
 administration of potassium than of ammonium bromide.  
 And in spite of the decomposing action of the sodium  
 chloride in the blood, it remains to be stated that  
 the potassium salt has not yet been superseded.

Bromide while acting as a depressant and sedative  
 on the cortex of the brain, also reduces reflex ex-  
 citability in the cord. On the circulation, it  
 causes a fall in arterial pressure and depresses the  
 heart's action. In large doses it may depress the  
 respiratory centre, disturb the digestive and alimen-  
 tary systems, lessen metabolism, produce apathy and  
 listless stupor and loss of sexual power. It is  
 supposed to lower the heat of the body, by its action  
 on the heart and by contracting the arteries. On  
 the skin, rashes may be produced of which the common-  
 est is acne. This may be prevented by administer-  
 ing liquor arsenicalis with the bromide, and if the  
 patient is cleanly *ms* will be found sufficient in

each dose. In the event of its occurrence, 3 to 5 minims with the bromide after meals will cause its disappearance.

Administration:

An endeavour must be made to find out the dose which is most suitable to the patient ~~that is~~, it must be given up to the point of toleration, or to the point required to arrest all attacks. Beginning in small doses of 5 - 10 grs. three times a day, it can be increased gradually to the point required. It is best given in watery solution and small doses of arsenic given along with it to prevent bromide rashes. The hours of administration are important, and depend on the time at which the fits are most likely to occur. If in the morning, a dose should be given before getting up, if in the evening a large dose can be given at bedtime. Nocturnal fits are less amenable to treatment than diurnal, and petit mal least of all. About one hour after meals is the best time for administering the dose if the medicine is taken thrice daily, and it should be taken in a tumblerful of water, which may be aerated. It is best that not more than 90 grains be given daily as a rule. The treatment is a prolonged one, and only after two years suspension of fits ought the dose to be reduced. It ought never to be suspended

suddenly, as status may supervene. Children bear the drug well, and pregnant women may take it without fear of deleterious action on the foetus. Mothers however should not suckle the child as bromide is excreted in the milk.

Large doses are not to be commended. If 90 grs daily do not effect arrest, little benefit is to be hoped from larger doses. It is certain that in insane epileptics, enormous doses may be given without causing complete disappearance of convulsions, and Gowers<sup>(1)</sup> has shown that increase of dosage does not hurry the cure. For nocturnal epilepsy, 60 grs at bedtime is a useful dose, and causes no inconvenience to the patient.

It is to be observed that, if the case is likely to be arrested by treatment, a satisfactory response will be early apparent.<sup>(2)</sup> More than half of the cases which are arrested show arrest within 12 months of the commencement of treatment. Treatment should be commenced early in the progress of the disease, the earlier the better. When mental degeneration has occurred, the most to be hoped for as a rule, is a reduction in the number and severity of the fits, and a reduction of excitability. No improvement is to be looked for generally in the mental state where the disease is of long standing, and the mind has been impaired for a length of time,

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1. Gowers. Epilepsy.

2. Aldren Turner. Lancet March 18, 1905.

though Clouston<sup>(1)</sup> noted improvement in one-fourth of his cases. Indeed, he recommends continuous bromide treatment for the majority of insane epileptics, and there is no doubt that many cases, especially where the insane development is of the form of mania, are vastly benefitted. But where on the other hand, dementia has followed, continuous drugging seems a doubtful procedure. The pulse rate and temperature are usually lowered slightly by prolonged administration, but no loss of weight ought to follow.

The bromides are not to be looked upon as the sum of medical treatment, and the means by which their action can be enhanced have been frequently previously referred to. How these act has been indicated also, and other agents, acting similarly, may be adopted if these are not admissible. One must guard against auto-intoxication, if not by baths and exercise, then by purgatives and copious amounts of water with the dose. Attention to the excretory system will not only aid in effecting a reduction in the fits, but will prevent bromide intoxication. This last is shown usually as follows:

I. Mental and physical depression: Loss of palatal reflex is an early symptom according to most authorities, but the writer has found it



frequently in insane epileptics who have had no bromides for months. (That the sensibility of the cortical motor cells is blunted by epilepsy is proved by the fact that a considerably stronger electric current is required to excite the motor areas of dogs dosed with bromide).

Apathy and lethargy follow, and this is denoted by the facial expression. Furred tongue, foul breath, constipation and diarrhoea, are symptoms of physical disturbance, and impotence may be complained of.

II. Bromide Eruptions: These as before stated are preventible, and to a large extent by hydrotherapy. Daily cold or tepid baths are extremely useful, especially if followed by brisk rubbing. Arsenic also may be used and the dose need not be a large one. The writer has found  $\frac{1}{2}$  minim thrice daily sufficient when prescribed with bromides administered for over one year. It is possibly wiser to begin with  $\eta$  2 and gradually reduce it, as though neuritis is hardly ever brought about, pigmentation may be.

The rash usually noticed is of an acneiform type, the red swelling being large and the pustular formation small. Pustular and papular rashes, however, are not uncommon, and ulceration may follow. (1)

Treatment consists in bathing, and adding 3 - 5 minims of Liq. Arsen., as described, to the dose. One has found sulphur ointment an apparent aid to this treatment.

This bromide rash is often produced when no sign of bromism is otherwise apparent, and in most instances is more of the nature of idiosyncrasy than of intoxication, the bromine, which is easily demonstrable in the pustules, being irritant to the patient's cutaneous system.

It has already been stated that the largest class of case only shows a reduction in the number or severity of the fits. And it is accordingly this class which predominates in Asylums, as the long duration of the disease tends inevitably to mental impairment. In this class of case one often finds the day fits arrested, while the nocturnal fits are little diminished. And one finds that petit mal is the most difficult form to influence. All epileptics ought to have a chart on which the hour and date of fits can be marked. In this way outside conditions can be noted in their influence on the convulsions, as well as idiosyncrasies. In Institutions where epileptics are kept together on the same diet and under the

same circumstances, whether untreated or not, great variations in the weekly and monthly totals are noticed, the latter being most marked. This is noticeable in male as much as in female cases and consequently does not depend on menstruation, though frequently female patients state that menstruation is the cause of increased number in seizures. Convulsions and menstruation, of course must coincide in some months of the year and probably this suggests an apparent causation. In ten female epileptics in whom the menstrual period and epileptic seizures were specially observed for 28 months, it was noticed that the fits were decreased in number in a large majority of the menstrual periods, and that no obvious relation could be determined in most of the cases. It is to be remembered that many epileptics menstruate irregularly, and consequently the calculation was rather complex. Each menstrual period was noted in each case with the duration. If a woman menstruated for four days, the fits during that time were counted, also those during the preceding four, and in the four days immediately succeeding. Four other days' fits were counted and the totals compared. This was done in each case, each time the menstrual flow occurred, the number of days usually varying with each period, so that each menstruation formed a separate basis of calculation.

A previous calculation on six cases has shown that though a close relation could be shown in five out of six in three successive months between the menstrual flow and an increase in the fits, on following out the cases, a definite decrease could also be shown in other months. For this reason it was thought that by selecting a definite number over a long period, just as sound results would be obtained, as by noting a large number over a few months. The results were as follows:-

Total of 28 months	=	10 patients.
Fits increased at menstrual period on	38 occasions.	
" " just before "	" " 44	"
" " just after "	" " 22	"
No definite relation	" " 61	"
Fits decreased at period	" 55	"

In the last instance, decrease means that there was also no increase during the days immediately preceding or succeeding the flow.

- See Table -

This seems to show that the relation is not always definite or the same, and White<sup>(1)</sup> noting records for two years in the City of London Asylum states that though menstruation seems to render patients more troublesome, it has no effect on the number of fits. This is surprising in view of the fact that Locock first used bromide in the treatment of epilepsy at the menstrual periods, and Haig refers<sup>(2)</sup>

1. Journal of Mental Science, January 1900.  
2. Uric Acid.



to the decrease in alkalinity of the blood during menstruation, which ought to tend to an increase in convulsions.

Discarding, then, menstruation, one comes to the cases where the fits tend to run in "serials". These represent a false status, as the patient, though unconscious between the fits, rallies spontaneously after each series is over. This may account for some of the chart extremes. It is noticeable that bromide treatment tends to level, while salicylate of soda seems to accentuate these differences in the monthly totals.

This, after investigation, seems to be due to the effect on these serial fits. But there are other causes to disturb the even occurrence of fits. Nurse Owen in Asylum News for May 15, 1906 noted on 66 cases, female, over  $2\frac{1}{2}$  years, that -

- I. Fits increase with rise of out-door temperature.
- II. Fits increase with a falling barometer.
- III. That in dull, wet, and stormy weather there are more fits than in clear or foggy weather.
- IV. That an increased number of fits occur with a full moon.
- V. That fits occur when the winds are W. or S.W. in the proportion of 5 to 1, when the wind is E. or S.E.

Some of these facts the writer has been able to confirm, and, with the exception of IV., he

suggests that they depend entirely on the opportunities allowed for out-door exercise and fresh air, the west and south west winds being "rainy". Appended charts will show these facts more clearly and also show differences to be noted in males and females.

Intercurrent diseases also may modify the number of fits, and this will be dealt with under "serum treatment". The object of dealing with these causes of variation, is to point out that in the following experiments, a suitable basis was sought for on which the relative value of the drugs tried could be appraised. Knowing the many variations that occur, it seemed advisable to contrast the action of various drugs with that of bromide of potassium over the same period of the year, so that the external circumstances might be the same, as well as the diet. This seemed surely preferable to testing the action against an untreated period only, or against other statistics where the classes of case are different, as well as the diet, hours of exercise, temperature of air, and other factors previously enumerated. That numerous fallacies still exist, the writer admits, but as far as possible, the cases selected as counter tests were similar in type, and of the same duration. Facts observed not mentioned in the text for the

purposes of conciseness will be exhibited on accompanying sheets and charts.

Other salts of bromine:

Sodium bromide; preferred by some because it is supposed to be less depressing in action, and because it is not acted upon by the sodium chloride in the blood plasma as potassium is, is little less efficient than the potassium salt. It often succeeds where the other fails, and in one case where the cause of the fits was subsequently found to be a scrophulomatous condition of the cortex and cerebellum<sup>(1)</sup>, it alone had any effect in controlling the convulsions.

Strontium bromide: is thought to produce less acne. It is less efficient than the potassium salt and is not well borne in large doses, and its poisonous influence is five times<sup>(2)</sup> as great as the potassium salt. Spratling<sup>(3)</sup> recommends it to be prescribed with other salts in combination. Singly the writer has found it disappointing.

Ammonium bromide: already referred to, has been preferred as being the least depressing salt. After a long trial singly, and in combination afterwards alluded to, the writer has found it less effective than the potassium or sodium salts.

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1. Described in Lancet by writer, 5th May, 1906.
  2. Tere. Ref. to by Gowers, Epilepsy p.272.
  3. Epilepsy, p.370.

Bromides of Nickel, Camphor, Rubidium and Ammonium, and Zinc have all received praise at the hands of various writers, but only small doses can be given, and the effect is not pronounced.

Bromethylformin: supposed to break up in the stomach into bromine and formaldehyde, is stated by Gowers to be of little influence and to readily cause acne.

Bromipin: a combination of bromine and sesame oil, contains 10 or 33% bromine, and has gained some reputation in America and on the Continent. It is of greatest use in asthenic cases and usually causes a gain in weight. It is best given in emulsion as otherwise it is not absorbed till the bile and pancreatic secretions have acted on it. It does not cause acne under maximal doses. Being expensive, prolonged trial has not been made of it, but it is less powerful than the bromides. It can be given hypodermically, and is frequently administered in enemata.

Hydrobromic Acid may be used where one wishes to give strychnine with bromide. Otherwise it cannot be of service, as in ordinary doses it has little influence.

Prescribing Note:

Bromides are best given with bitter infusions



and often, in cases subject to constipation, can be prescribed with liquid extract of Cascara, or compound decoction of aloes. The dose should be taken as stated with water.

Liq. Strychnine should not be prescribed with it, for obvious reasons.

#### Adjuncts to Bromides:

The following drugs which are of little value alone, seem occasionally to enhance the action of bromide to a marked degree.

#### Iodides:

These are of no use alone and have not been found beneficial in combination by the writer. Wilks<sup>(1)</sup> originally prescribed iodides with bromide of potassium. They are useful occasionally in excitement when given thus, especially in subacute epileptic mania.

#### Alkalies:

It is presumable that much might be expected from this group of drugs. The connection between decreased alkalinity of the blood and the onset of the fit has been already referred to. And the success of a purin-free diet would seem to suggest that if the toxin in the blood is uric acid, alkalies ought to be beneficial. Haig quotes

1. Medicinal Times, December 21, 1861.

Radcliff<sup>(1)</sup> as stating that alkalies are of great benefit, when combined with bromides. But if Haig's standpoint is right, that epilepsy is the result of uricacidaemia, alkalies ought to be beneficial in themselves. Trials made with potassium citrate, acetate, and carbonate over several months have convinced the writer of their inability to influence the seizures, and their combination with bromide and borax have not been more successful in his hands. Tests made on a supposed analogy with gout have proved even less successful as where pot. carb. and vin. colchic. were prescribed together, and increase in the number of fits occurred, which was probably due to the disturbing effect of the colchicum on the gastro-intestinal system.

(See illustrative cases on charts).

It is unnecessary to enter into the rationale of such experiments at a time when so much is written about the treatment of the "periodic neuroses". Even in the preceding part of this paper enough evidence has been adduced to justify them, and current literature seems to regard the close relationships of gout with epilepsy and asthma as proved. Still less justification is required for giving long trials to the

Salicylates:

These present close analogies with the alkalies. They have been found successful in the treatment of diseases formerly the preserves of the alkalies, so to speak, and in many cases have superseded them. They effect, in their passage through the system, such modifications of metabolism as are evidenced in the urine by increased excretion of nitrogen, sulphur and uric acid.<sup>(1)</sup> They are stated by Haig to be far superior to the alkalies in effecting the removal of uric acid from the system, and were used by him in conjunction with a purin-free diet, in cases of epilepsy with success and in some cases helped to effect cure. To determine their uses in epilepsy of long standing the writer gave the drug trial as follows :-

Seven male cases of epilepsy all of long standing were in October 1904 ordered the following mixture,

Sod. Salicyl. gr XX.

Ext. Glyce. liq.  $\eta$  XX.

Aqua ad 3 I.

three times daily after food, and seven of a similar type were ordered :-

Pot. brom. gr XXX.

Ext. Glyce. Liq. XX.

Liq. Arsen.  $\eta$  ss.

Aqua ad 3i

given similarly.

As far as possible the patients were of similar type in these groups, though the individual cases in each group were varied, differences existing in the duration of the disease, age at onset, number of seizures and degree of mental impairment, but all the cases were under the same general conditions. Treatment was continued for six months, and during this time, the total number of fits credited to those taking salicylate was 285, the total for the same patients during the previous six months being 323. This represented a reduction to 88%.

In the case of patients taking pot. brom., the corresponding totals were 197 and 373, a reduction to 52%.

The result could not be said to be encouraging, but one was struck by the tolerance the patients exhibited for the drug. No case of salicylism was noted during the entire period, and at the end of the time, three patients had gained in weight, and four had lost, the greatest individual loss being 8 lbs. Of those on bromide, two gained in weight, and five lost, the greatest loss being



7 lbs.

At times the urine did not give the typical reaction, though it was obtained frequently in each patient, and this point is also commented on by others<sup>(1)</sup>. The temperature remained between 97° and 98.2° in each case including those on bromide, and the pulse rate averaged 76 for those on salicylate, and 74 for those on bromide.

One striking feature of the treatment was the rarity of headache or excitement after the fits, and there was much less mental confusion and no lethargy, compared with the patients on bromide. All were interrogated regarding noises in the head with a negative result, and this was surprising, inasmuch as any such symptom might easily have been interpreted by the patients as "voices".

The general conclusion drawn from the experiment was that the administration of sod. salic. would be beneficial in the post-convulsive stages, while it might safely be given in combination with bromide over a long period, both as an adjuvant in the diminution of the seizures, and to alleviate other symptoms not affected much by bromides. Here one may state that sod. salicyl. was also administered to several female patients, on whom the same effects were noticed, and that in three patients who were having a series of fits, the seizures stopped after 1. Haig, Uric Acid, p.303.

the first dose of sod. sal. grXX. In other similar cases, however, it failed to produce this action.

Seven male patients were now ordered the drugs in combination as follows:-

Sod. Sal. gr.XX.

Pot. brom. gr.XXX.

Liq. Arsen  $\eta$  ss.

Ext. Glyce. liq.  $\eta$ XX.

Aqua ad 3i

This was taken over a period of nine months and the results were very satisfactory, every case showing a reduction in the number of fits. This action, however, was in no case a progressive one, and was most marked in four cases. It was noticed that sudden increase in the number of convulsions occurred in every case, and this phenomenon was found just as markedly in the case of the patients previously treated by salicylate alone. Comparison with untreated cases and patients on bromide, seemed to indicate that the salicylates are responsible for a tendency of the fits to become serial in character.

The patients suffered less from excitement or stupor and were improved in every way by the treatment. The total amount of fits during nine previous months was 908, and for the period under

treatment, 337, the lowest total for any one month being 18, of which 12 were recorded by a single patient, and this being the fifth month of treatment. The total reduction was, therefore, one to 37%. No case of bromide rash occurred, and four of the patients lost weight, the greatest loss being 7 lbs, and three gained, the greatest gain being 5 lbs.

On analysing the results, it is evident that this combined treatment is a success, and reduces the fits of insane epileptics just as markedly, and in most cases to a greater extent, than bromide alone, and has many advantages. Comparing the figures with those of Clouston obtained by administration of bromide, the success is not so apparent, but here the dosage was the same throughout, and several cases previously treated by bromide showed a greater reduction when salicylate was added. The tendency to sudden rise in number of the fits is marked, and reveals a contrast to the comparatively even monthly charts of patients on bromide alone. It is less marked in weekly counts of the fits.

Nine female patients were put on the same medicine on 1st March 1906. Unfortunately previous months could not be contrasted satisfactorily, as several had had various doses of the bromides.

But none had taken any for eight weeks preceding the start of the trial. During the first eight weeks the fits were reduced to 24% and after that the records were modified as follows. On the 20th April all the patients were subjected to salt-starvation, when a fall to 20% occurred. On May 6th, five of the patients were put on a purin-free diet and dieted thus for six months, and in their case still further reduction occurred. Withdrawal of the diet was followed by an increase in the seizures, and withdrawal of the medicine, though the sod. bromide was retained at meals, resulted in an enormous increase in the number of fits, one patient passing into status. These facts are set forth more clearly on accompanying charts.

The power of the medicine to enhance the value of a purin-free diet and vice versa, was shown in a marked degree. The patients were well conducted and gave little trouble. One case had only 11 fits during the 10 months she had the medicine, while previously she had an average of three per week. Other two cases who also had the advantage of a purin-free diet had 15 and 2 respectively for the whole period, while their previous weekly average was three and six. All the patients on diet in addition gained in weight during that period, and of the nine patients, four had lost slightly in



weight at the end of ten months.

In its freedom from many of the disadvantages of bromide alone, it is evident that this combination is of great benefit in the treatment of epilepsy with mental disorder, and the writer is convinced that in many such patients it is to be preferred to bromide.

In an attempt to find some combination which would also correct the tendency of the fits to come in groups, trials were made of the following:

Aspirin: This was given as acetylo-salicylic acid most of the time, and while useful in relieving headache after fits, and apparently in some cases stopping a series when given alone, did not prove serviceable either singly or in combination in effecting reduction in numbers.

Salicylic Acid showed no advantage over salicylates.

Benzoic Acid proved useless either singly or in combination. It was also given with borax but proved ineffective.

It may here be stated that in one instance of petit mal with migraine, the patient (not insane) found relief from fits by taking a purin-free diet, and one or two doses per week of sod. salicylate.

A long trial was also given to sod. sal. and Ammon. brom. in combination. Haig<sup>(1)</sup> states that Ammonium salts are much more likely to help the action of sod. salicylate than potash, and accordingly a trial was made on ten patients. The results were not so satisfactory as in the former combination as after six months of the treatment, the medicine seemed to be less efficacious and the number of fits began to increase. It was carried out for 10 months, but patients who had formerly had a course of sod. sal. and pot. brom. did not seem to be benefitted so much by the Ammon. brom. combination, while on the other hand, several who had their medicine changed to pot. brom. alone soon had an increase in the seizures. On the other hand, the fits were more even from month to month and further trials will be made between the combinations.

Salol proved of no value in the writer's hands. While treating of this group of drugs, one may add that urea in 40 gr doses three times a day was tried on three cases for four months, with the result that the fits increased in number.

Chloral hydrate:

This drug is of little use in the treatment of ordinary fits, It is valuable in mental excitement, especially in that which comes before attacks, and is useful along with bromide in the status epilepticus, and in the treatment of serial attacks.

Butyl-chloral hydrate, judged by its administration on four patients for four months did not appear to have any action on the fits. Indeed it is less satisfactory than chloral as the latter appeared to reduce the number somewhat when the patient was kept under its influence. Chloral was tried in 10 gr doses thrice daily and butyl-chloral in 5 gr.

Trional is also useless, and is condemned by Spratling<sup>(1)</sup> who gave the drug a fair trial.

Opium is a drug which must be given charily to epileptics, and hypodermic injection of morphia is a risky proceeding. The reputation of the drug now rests on Flechsig's treatment, which consists in keeping the patient in a state of mild narcosis under opium for six weeks, the dose increasing up to 15 grams a day. The opium is suddenly withdrawn and bromide 130 grams a day substituted, this being gradually reduced after two months.

While some writers assert that the fits are greatly reduced in cases previously unaffected by bromide treatment, nearly every authority is agreed in giving an unfavourable verdict regarding its employment. It does not prevent status occurring.<sup>(1)</sup> The writer's experience is limited to two cases but the result was unsatisfactory. The indications for the use of opium as well as chloral in combination with bromide will be referred to under "Status Epilepticus".

Cardiac Tonics, such as strophanthus, digitalis and convallaria are often useful in conjunction with bromide. How they act is not quite apparent, but probably it is by rendering the blood supply to the brain more equable. The writer has tried strophanthus singly and in combination and found it to enhance the value of bromide in one or two cases. Digitalis given alone proved valueless, but Gowers finds it of great benefit occasionally along with bromide. Bechterew<sup>(2)</sup> has the same testimony for convallaria.

Belladonna should be tried whenever bromide fails<sup>(3)</sup>. It often arrests petit mal, and is useful for night attacks when given with bromide before retiring. It is significant that convallaria

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1. Bratz, ref. to by Gowers Epilepsy, p.285.  
 2. Ref. by Gowers, Epilepsy, p.279,  
 3. Aldren Turner, Lancet 18 March 1905.



and belladonna are often of value in this disease, when one notes how frequently they prove of more service than digitalis and strophanthus in the tachycardia of Graves disease.

Gelsemium has been tried and Cannabis Indica occasionally with benefit. The latter is often of service in excitement (Clouston) but the writer has found that along with bromide, butyl-chloral hydras gr X. with pot. brom. gr.XL. was more useful in epileptic excitement than a combination of Cannabis Indica and pot. brom.

Hyoscine has been tried by Gowers, but its chief use is in "Status".

Nux Vomica. This drug is not referred to by most authorities or writers on epilepsy. It has already been mentioned in the treatment of epilepsy associated with indigestion, one form of reflex epilepsy. It seems to be most in favour with homoeopaths, and is given in small doses. The writer's attention was drawn to it in February 1906 in some correspondence in the lay press, where great claims were made for it. He has since tried on four cases alone in  $2\frac{1}{2}$  minim doses, and on four cases in  $\eta$ 5 doses in combination with bromide. Six months trial showed no improvement in three of

the cases, but the fourth, an epileptic imbecile has had no fits for eight months, ever since he started taking the drug. There were no symptoms of accumulative action observed. In the four cases who had the drug in combination, no farther reduction occurred than in the case of bromide alone. Farther trials are necessary before any definite conclusion can be reached. Whether it acts by virtue of its effect on the circulation or on the nervous system is doubtful.

Phenazonum. Antipyrine was first recommended by Lemoine. It does not seem to have had any favourable action with most authorities (Turner, Gowers, Spratling). It was given a trial in this Asylum for seven months on four cases. Two of the cases showed a very slight increase in fits, but of the other two, one had his fits reduced to four-fifths of the number recorded for the previous seven months, (299 to 238), and the other two-thirds (184 to 112). In the last case the nocturnal fits showed the reduction while the diurnal were unchanged. No untoward symptoms were observed in any of the cases, and examination of the blood from time to time, showed no diminution in the number of corpuscles, white or red, but several times the haemoglobin seemed to be markedly collected in the

centre of the red cells, and presented a granular appearance. This, however, was noticed in other patients especially soon after a fit.

The other coal-tar derivatives are of doubtful benefit.

Quinine in the form of the sulphate grs.III. t.i.d. proved useless when tried on several cases by the writer and quickly caused cinchonism, a fact surprising when one considers that salicylism was never caused by repeated doses of sodium salicylate.

In cases where bromide has been tried and found of no avail, other drugs may be given with considerable benefit. Mention has already been made of belladonna, and urethan, solanum carolinense and simulo, are recommended under the same qualifications by Spratling. But at present borax, introduced by Gowers, has the most established reputation. Its dose initially is 15 grains, but in combination with bromide, smaller doses ought to be given, three times daily. Its disadvantages are that it occasionally causes diarrhoea, psoriasis<sup>(1)</sup> or furunculosis.<sup>(2)</sup>

It does not always succeed even when bromide has failed, and has proved disappointing in such cases in the writer's experience, where the epileptics are insane. Even in combination with

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1. Gowers.  
2. Spratling.

alkalies, and with pot. bromide it has seemed of little use, but one brilliant exception must be made in the case of an intractable nocturnal epileptic, in whom after numerous failures with other remedies, borax and pot. brom. in 20 gr. doses in combination, have succeeded, and who for the past eight months has been free from seizures. It is possible that some of its action may be due to its disinfectant power, and the virtues of boric acid and calomel recommended by McLane Hamilton in toxæmic epilepsy, in this relation would be similar. And it is also possible that Arsenic and tinct. ferri-perchlor. owe some of their efficacy to a like action.

The psorasis caused by borax is relieved by the addition of liquor Arsenicalis.

Nitro-glycerine is best given in a one per cent solution in glycerine, and 10 to 15 minims of dilute hydrobromic acid ought to be added to each dose, as it must be rendered acid to ensure its stability.

It is most useful in children who suffer from momentary loss of consciousness, but is also to be recommended in cases of senile epilepsy with evidences of arterio-sclerosis. Its action is rapid, and of short duration, so that it must be given



every three or four hours.

It is also of use in the periodic headaches accompanying epilepsy. Spratling recommends it along with bromide where the circulation is feeble and the extremities cold. One may state that reference has been made to the common occurrence of cold extremities in children with this disease, and that while nitro-glycerine is most useful where attacks of petit mal are frequent, one may get good results from any cardiac stimulant where the attacks are at longer intervals.

Chloretone in its results is likened by Spratling to Flechsig's treatment and is not advisable.

It is given in 6 grain doses three times a day.

Zinc is best given in pill form, the oxide being the salt most commonly used. It may be given alone, 2 to 10 grams thrice daily, or bromide may be given as well. Individual susceptibility to it varies greatly. Its action is analagous to bromide, but less powerful as a rule, but it sometimes succeeds where bromide fails.

Iron is useful in cases complicated by anaemia and often succeeds along with bromide, where the latter alone has little effect. Gowers has made long trials with it, and believes its beneficial

influence is not confined to its haematinic effect, and quotes Meyer and Williams<sup>(1)</sup> experiments to show that it has a specific action on the nerve centres. It is usually given as the perchloride in tincture form, 10 - 15 minims three times daily.

Nitrate of silver is still prescribed, but this is rarely justifiable as its action is slight, and long use causes the well known discolouration of the skin.

Other remedies not of much beneficial value are numerous. There are few drugs that have not been tried in this disease, and little is to be gained by recounting those that have failed. As far as possible the above list includes all that offer any appreciable hope to the physician at the present time, though there are records of cases much benefitted by other drugs under special circumstances, such as chloroform<sup>(2)</sup>, oxygen<sup>(3)</sup> in inhalations, Amylen hydrate<sup>(4)</sup> and osmic acid.

Forms of faith-cure may be referred to. The commonest in Devonshire is for the afflicted persons to appeal to a clergyman for special prayers at the service. Thirty married persons of the opposite sex - it is usually a woman, by the way, who makes use of this form of cure - wait for the patient at

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1. Gowers Epilepsy, p.293.
  2. Spratling, Epilepsy, p.385
  3. Lancet, 26 August 1905.
  4. Wildersmuth.

the porch of the church after service, and each puts a penny into her hand. The thirtieth takes out the copper coins and replaces them by a half-crown. This is made into a ring and worn by the epileptic, and the writer knows of two instances where recovery is said to have resulted. Of failures on the other hand, he has had no report, though probably this is in accord with the hopeful nature of epileptics, who seem to think every fit is their last. Other forms of faith-cure, such as the wearing of charms and amulets abound, but these do not seem so successful!

#### Organo-therapy: .

Various forms of this have been tried, mostly with a view of preventing mental deterioration. Cerebrin seems to be valueless, and thyroid gland meets with no more success. In the writer's experience, the fits may be suspended or reduced for a time, but when cardiac symptoms cause the withdrawal of the treatment, the fits recur, usually in increased numbers.

It is of note that epileptic imbeciles often show enlarged thyroid, sometimes cystic goitre, and sometimes enlarged and persistent thymus. Adminis-  
(2)  
tration of the last is said to aggravate the disease.

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1. Turner, Lancet, March 18, 1905.
  2. Hodgson, Medical Chronicle, 1903.

Before discussing the serum treatment of epilepsy, it would be well to summarise some of the points connected with drug treatment. The value attached to certain drugs by any physician must in time depend on results obtained in his own experience. Now-a-days many of the ill-effects laid at the door of bromides are now credited to the disease itself, especially mental symptoms. This is probably a more reasonable view, and one which is daily gaining more weight. But it is undoubted, that, as the mind deteriorates, the epileptic reacts less and less to the effects of the bromide, so that epileptic dementes are little benefitted by the drug. This would tend to show that the action of the bromide salts is mainly on the cortex, and to some extent explains why the bromide treatment should be the first resort after general measures fail. It is a curious fact that few asylum physicians obtain good results by the borax treatment, and one not easily explained, but then insane patients do not seem to react readily to most drugs. The writer's experience has been gained largely amongst the insane, where alleviation, and not cure, was the goal, for this was the most that could be hoped for. Accordingly his results must be somewhat discounted, but, where they are positive, it is probable they would be much more so in sane epileptics. They emphasise the gulf separ-



ating bromides as a medicinal agent from the next best, and they draw attention to individual differences in reaction. On the other side these patients may in many cases be looked on as failures, especially bromide failures, as the majority have been treated thus before admission. It is rare, however, for them to have had a period of "epileptic regime" if this term may be applied to the baths, diet, and exercise which so often prove of value. It is in these apparently hopeless cases that general measures assert their efficacy, and it is likely that were more attention paid to this, the ratio of recoveries would rise. As every epileptic is a potential lunatic, no more emphasis need be laid on the point that the treatment must be individual. A 10% recovery rate under bromide, and a corresponding rate<sup>(1)</sup> under Zinc and Silver treatment speak for themselves, though unfortunately at the risk of minimising the importance of the former remedy. That the general treatment indicated increases its efficacy is not the least point in its favour.

#### Serum treatment:

This is due to Ceni.<sup>(2)</sup> The theory on which it is based is in the belief in the existence of a toxic biochemical substance in the blood of epileptics. He concluded from his experiments that there were two

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1. Lancet, Feb. 14, 1903. Proceedings of Medical Society of London.  
 2. March 8 & 15, 1902.

factors present, one existing in a free state and possessing toxic properties, the other circulating in a latent state, and having the power of elaborating the toxic agents. His results were disappointing, and later investigations have been even more so, failing, indeed to confirm the originator's and the treatment holds out little hope that success lies along this path, the same being true so far of the method of inoculation by cultures of bacteria. This was based on the fact that intervurrent diseases often have a remarkable influence on the progress of epilepsy.

Malaria sometimes causes some alleviation of the disease, and its relationship has been investigated in recent years by Montyel and Dide.<sup>(1)</sup>

Typhoid presents similar modifications in some instances, as also Measles<sup>(2)</sup> and Diphtheria<sup>(3)</sup>. The effect of Erysipelas<sup>(4)</sup> is sometimes a like one but in the writer's experience its incidence in epilepsy is often fatal. He has seen the fits suspended during an attack of Quinsy, and Clouston calls attention to the beneficial influence of wounds with purulent discharge. In one case which developed pernicious Anaemia, the fits were reduced in number, and were still farther reduced by soda salicylate. But it

1. Revue de Medicine, 10th December, 1899.

2. Medical News, 1st December 1900.

3. Spratling, p.388.

4. Amer. Journal of Insanity, Oct.1898.

is true of these diseases that their effect is not always beneficial, and in some instances they seem to produce status. They are often, too, advanced as exciting causes of the disease, and cases admitted to this Asylum have ascribed their epilepsy to attacks of measles, typhoid and scarlatina.

It is known that the alkalinity of the blood is diminished in fevers, except when cyanosis occurs, (Peifer.) and that the acidity of the urine is increased in all fevers. Roberts<sup>(1)</sup> relates a case where the onset of erysipelas determined a change in a patient's urine from alkalinity to acidity. It has already been noted in this paper that increase of acidity of the urine in epileptics is coincident with a diminution of power to cause convulsions. And it is possible that one has here an index of the benefit often seen in intercurrent diseases, especially erysipelas. Hessler<sup>(2)</sup> has recorded several cases benefitted by the injection of erysipelas anti-toxin, but on the whole, the results of the injection of bacterial products are not encouraging.<sup>(3)</sup> While there are some cases which are improved by these attempts at serum treatment, they are in all likelihood cases where the disease is mainly toxæmic in character. These can only be determined by elimination, as the majority of epileptics do not owe their disease to this one etiological factor, and the treat-

1. Urinary & renal Diseases p.59

2. American Journal of Insanity, Oct.1898.

3. Russell, Lancet, Feb.14, 1903.

ment is thus suitable for selected cases only.

### Status Epilepticus.

#### Prophylaxis:

This is of great importance in a case of epilepsy. When serial attacks are present during the course of the disease, the medicine employed should be given at times just preceding the threatened attacks. It is important that if bromides are being administered, they should not be suspended suddenly, as this often precipitates the condition. Pierce Clark<sup>(1)</sup> gives the proportion of fatal cases due to this cause as one-third, though this is certainly not the case in Asylums. It is well established, however, that sudden cessation of bromide treatment is followed by a tendency to increased number of seizures, and also to status. The same is true of such cases where the attacks have been suppressed for some time without apparent reason.

Partial Jacksonian epilepsy also often ends in this condition.

#### Treatment:

It is well to remember that status epilepticus is divisible into two stages, the convulsive and the stuporose. That the sedatives indicated for the

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1. Status Epilepticus in Spratling's Epilepsy, p.202



first stage may prove detrimental in the second. And that death is likely to result from exhaustion with congestion of the lungs. The mortality from status is usually asserted to be due to

I. Collapse, or

II. Meningitis with bedsores following.

(1)  
Bevan Lewis states he has never seen the latter as a cause of death, but that death is generally the result of exhaustion with hypostatic pneumonia. The writer's experience has been an exactly similar one.

There are cases in which a series of fits succeed one another so rapidly that the patient remains unconscious between the fits, but in which recovery ensues without interference. These are not uncommon in the writer's experience, and introduce fallacies into any series of statistics as to the mortality or efficacy of various remedies in status, as where drugs have been administered one cannot discriminate between the post hoc and propter hoc. Sometimes such attacks recur in the same patient, and though one may be tempted to hold one's hand from a previous experience of the case, interference is undoubtedly advisable in all cases. Whenever four or five convulsions occur in succession a mixture of bromide and chloral should be administered, but the addition of opium seems to be even more satisfactory.

The following prescription is very suitable:-

R<sub>x</sub> Pot. brom. gr. XL.  
 Chlor. hydr. gr. XV.  
 Tinct. Opii  $\eta$  X.  
 Aqua ad 3i  
 Sig. Repeat if necessary in an hour.

It may be necessary to give the medicine per rectum in which case the amount of chloral can be doubled with advantage.

An injection of morphia may be of value at this state, or liquor morph. hydrochlor.  $\eta$  XX. may be substituted for the tinct. Opii. in above mixture, as it answers quite as well in spite of supposed incompatibility with alkalies.

At this stage also, powerful cathartics may be of great advantage, ol croton  $\eta$   $\pi$  mixed up in a small piece of butter being probably the best.

A little later in the condition, or if the fits fail to be arrested by this treatment, hyoscyne hydrobromate ought to be injected. This may be adopted as the line of treatment from the first,  $\frac{1}{100}$  gr. being injected, followed by  $\frac{1}{200}$  gr. in half an hour if the convulsions continue, and another  $\frac{1}{200}$  gr. at end of an hour, though this is rarely necessary. Dr Raffle of the Exeter City Asylum informed the writer that he has treated fifteen successive cases of status in this way without a fatality. It has not proved so successful in this Asylum, and Raffle<sup>(1)</sup>

1. Thesis on Status Epilepticus. Univ. Durham 1907.

suggests that the hyoscine may be at fault, he securing the drug only from Merck. It is however a most successful plan to follow and the fatality rate is far less than that recorded by most authorities, the lowest being that of Spratling based on 100 cases of status, viz. 14%.

Bevan Lewis<sup>(1)</sup> recommends the injection of Atropine (~~7~~<sub>20</sub> gr. - ~~60~~ gr.) where chloral is administered by mouth, ensuring less likelihood from danger from the latter drug, in view of the probable occurrence of congestion of lungs in the exhaustion stage.

Should the convulsions still continue and threaten the patient's life, chloroform may be administered while enemata of bromide and chloral are continued, nourishment being administered in the same way. The use of chloroform inhalations is restricted to its power to hold the seizures in abeyance till other remedies begin to produce their effect. Sodium bromide - 120 grs. in 10% solution<sup>(2)</sup> - may be injected hypodermically at this period in place of the enemata of chloral-bromide.

The above constitute the main lines of treatment in the convulsive state. In the writer's experience the mixture of opium, bromide and chloral, followed if necessary by the hypodermic injection of hyoscine as detailed, is usually sufficient to arrest the convulsive stage. Other means and

1. Text-book of Mental Diseases, p.283.  
2. Pierce Clarke in Spratling's Epilepsy.

remedies are recommended and have their various supporters.

Ice applications to the spine, (Gowers, Crichton-Brown). Venesection, (Bourneville) ergotin injection, (Solwith) Amyl Nitrite, (Crichton-Brown) Amyl hydrate (Wildermuth) chloretom, and inhalations of ether have all had varied success. The writer has seen aspirin and salicylate of soda arrest the convulsive stage in some cases.

The treatment of the stuporose stage depends largely on the effect of the convulsive stage on the patient. Stimulants can be given freely, alcohol and strychnia with digitalis. The danger of complications has been mentioned, and has to be guarded against. Food easily assimilable can be given by the nasal tube or rectum; the main aims of the physician being to support the strength of the patient, and to counteract the effects of the drugs employed in the first stage.

Delirium, insomnia and violent excitement may follow in the post-status period, and suicidal or homicidal attempts may be made especially if the patient be insane. By keeping the subject quiet in a darkened room, and giving pot. brom. with cannabis indica, or butyl-chloral hydrate as previously mentioned, and feeding him well with hot milk and an allowance of whisky or other stimulant,



excitement and motor restlessness are overcome. For insomnia, digitalis during the day in small doses, hot baths, and paraldehyde at night are usually successful. From long experience with hypnotics, the writer is convinced that these act far more readily if cardiac tonics be administered during the daytime.

Physical restraint is never advisable.

During the occurrence of status, the patient should be put on a mattress on the floor, and other mattresses used as side pads. A roll of cloth may be useful to prevent biting of lips or tongue, but no attempts at holding the patient to restrain the force of the convulsions should be made. Immersion in cold water for the accompanying hyperpyrexia has been tried<sup>(1)</sup> and favourably commented on. The importance of giving the patient plenty of water to drink should not be overlooked; often the first conscious demand of the patient is for water.<sup>(2)</sup>

It is a point worthy of emphasis that while bromide treatment is the soundest for prolonged administration, acute epileptic outbursts can best be controlled by chloral. In the epileptiform attacks occurring in general paralysis of the insane, chloral hydrate is the main resource of the physician. And with a knowledge of the importance of these two drugs in the medicinal treatment of epilepsy, one need not feel badly equipped.

1. Gowers. Epilepsy, p.296.

2. Clark. in Gowers Epilepsy, p.219

### III. SURGICAL TREATMENT.

Though a full discussion of this line of treatment is out of place in a medical paper, a brief consideration of the various procedures is essential.

(a) In reflex epilepsies, where a source of peripheral irritation can be determined, its removal is usually to be recommended, and may bring about a cessation of the attacks. Scars involving a nerve, urethral stricture, growths in the nasopharynx<sup>(1)</sup>, foreign bodies in the ear, and various abdominal diseases, mostly of the reproductive system, may all act as reflex excitants of the convulsion.

Movable kidney<sup>(2)</sup> has also been credited with playing an active part in the induction of epileptic convulsions, and operations for fixation have been attended with good results.

Any disorder of uterine functions in a female epileptic should be investigated, and operations such as hysterectomy or ovariectomy are sometimes beneficial in their effects on epilepsy. In these cases they are only to be looked on as part of the treatment for improving the general health of the patient.

1. Woakes, Lancet, 16 Augt., 1902.

2. Suckling, Movable Kidney, pp.88 & 91.

Eye-strain in recent years has been counted a most important factor in causation, and its relief by the corrective aid of glasses often brings about immunity from headaches or in some cases a reduction in the number of fits. Muscular correction by operation has much the same effect, but the results on the fits alone are not encouraging.<sup>(1)</sup>

(b) Counter-irritation; as by seton in the neck, is falling into disuse, as modern writers do not seem to find it of any benefit.

(c) Ligature of the vertebral arteries, and resection of the cervical sympathetic are also abandoned, the results obtained not justifying their employment.

(d) Trephining is permissible in some forms of the disease, in others it is wholly unjustifiable.

Amongst the conditions which exclude any operative interference must be stated petit-mal, psychic epilepsy, hystero-epilepsy, serial attacks and status, as no improvement is to be expected from surgical measures.

One is left thus with

1. Grand mal,

Idiopathic,  
Organic,  
Traumatic.

1. Spratling.

## 2. Jacksonian Epilepsy.

### Idiopathic Grand Mal:

The operation of trephining in this class of case was first performed under the assumption that intracranial tension was the basis of the attacks. This theory being now untenable, the operation, one rarely followed by lasting benefit, is not to be regarded as advisable.

Excision of part of the cortex where a localising symptom is present, i.e. where the convulsion starts usually in the same part of a limb, is of doubtful benefit.<sup>(1)</sup>

### Organic Grand Mal:

These are the instances where the attacks indicate disease of a definite region of the cortex, whether from new growths - to be diagnosed in the interparoxysmal state - or from the results of faults in the vascular system of the brain.

Early diagnosis is essential for any expectation of success. Simple trephining, of course, is of no effect. If the case be operable amelioration may be hoped for, if the removal of the cause by operation prove successful.



Traumatic Grand Mal:

Here there is a history of trauma. Fits of a Jacksonian type may become in time indistinguishable from the grand mal of idiopathic epilepsy. One must look for scars on the scalp, or for signs of cranial injury on the vault. The scar need not correspond with the site of the affected area of the cortex, this being determined from the limb in which the fits commence. (1)

Scars may of themselves be deceptive, as they may be a result, and not indicate a cause of the convulsions. The inheritance and history of the patient must be carefully investigated, and it must be remembered that, where predisposition to epilepsy exists, an injury may be the means of breaking down the barrier between the epileptic and non-epileptic states, and start the perpetuating cycle of the seizures. If such a predisposition be ascertained, one would hesitate to recommend operation. On the other hand, if the previous history of the patient be good, such a step becomes nearly compulsory, and the removal of any local pressure on the cortex may be attended with the happiest results. The operation should be performed as soon as possible after the first fit. To Jacksonian Epilepsy, these last remarks also apply.

Epileptics as a rule stand operations well. Morphine should be injected before operation, and it is better that the patient be not taking bromides, though these should not be left off suddenly, for fear of inducing status. As knowledge of the disease advances, it is likely that surgical intervention may be more restricted, or called in only where a definite improvement is likely to accrue. At present, about one-fourth of those operated on, are improved.<sup>(1)</sup>

In coming to a decision, the physician will be guided by his own knowledge of the patient, remembering that it is the individual and not the disease that he must consider first. If the case be one of idiopathic epilepsy, treatment is to be sought for on other lines than surgical. If, however, an indication of some localised lesion is present, supported by the history, he will early call in the aid of the surgeon, and not without hope.

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1. Spratling. Epilepsy and its treatment.